Visualizing Motion

One of the most effective methods of describing motion is to plot graphs of that motion. From such a graphical representation, it is possible to determine in what direction an object is going, how fast it is moving, how far it traveled, and whether it is speeding up or slowing down.

The Motion Detector measures the time it takes for a high frequency sound pulse to travel from the detector to an object and back. Using this round-trip time and the speed of sound, the software can calculate the distance to the object; that is, its position. In this activity, you will look at a graphical representation of the changes in position over time.



Figure 1

Objectives

In this activity, you will

1. Use a motion detector to create motion graphs.
2. Predict, graph, and test position *vs*. time graphs.

MATERIALS

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| LabQuest Mini | Logger Pro Software |
| Motion Detector |  |

PROCEDURE

You will make motion graphs by moving towards or away from the motion detector in order to create position *vs*. time graphs that have specific shapes. For each trial, add a copy of your graph to this document and write a brief description of what motion was necessary to create the graph. To start data collection, click on the CollectNew button.

Data

Trial 1: A line with a positive slope

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| **Describe the motion used to create this graph: put hand higher than 15 cm and then just raised it gently** |

Trial 2: A line with a negative slope

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| *Insert your graph* |
| **Describe the motion used to create this graph: put hand 2/3 meter above sensor then lowered slowly** |

Trail 3: A horizontal line

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| **Describe the motion used to create this graph: held hand at one height above the sensor** |

Trial 4: A graph with two linear sections with distinctly different positive slopes

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| **Describe the motion used to create this graph: raised hand slowly, then raised hand faster** |

Trial 5: A graph with two linear sections with distinctly different negative slopes

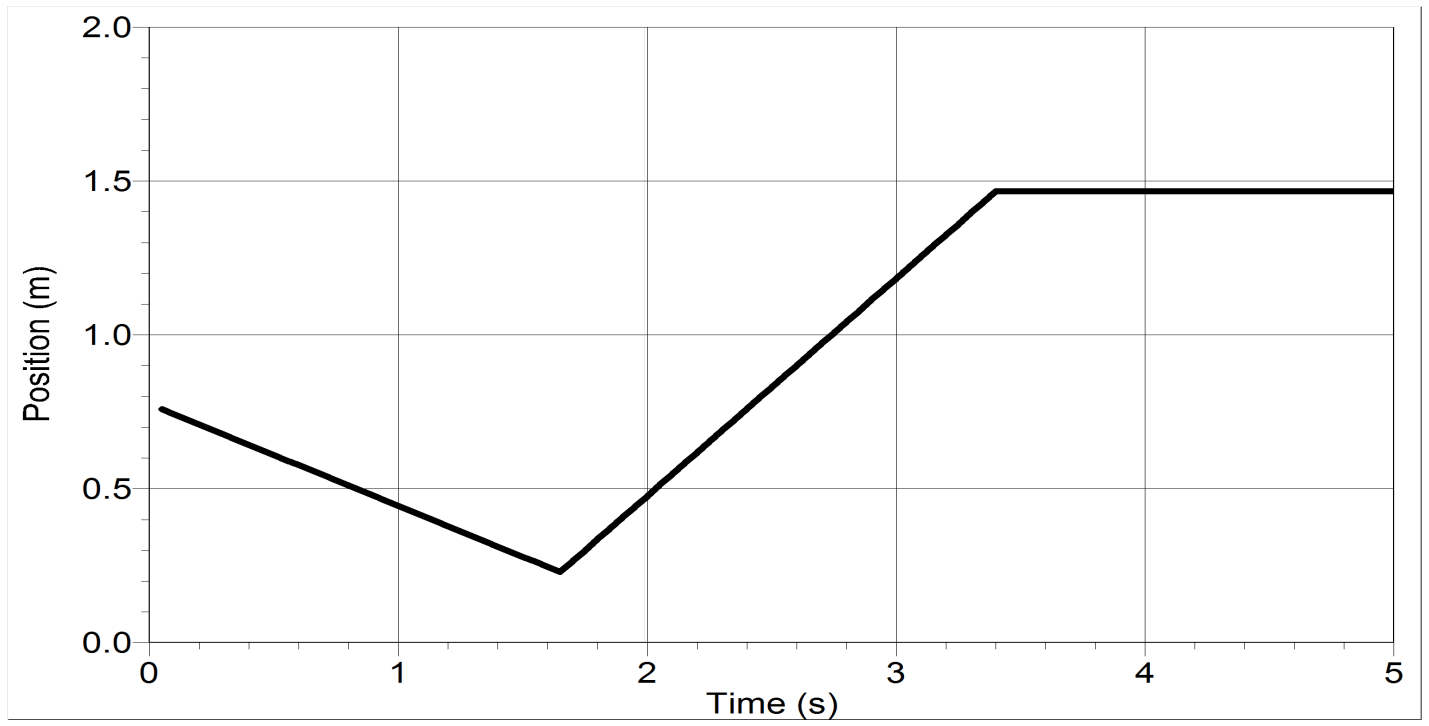
|  |
| --- |
| *Insert your graph* |
| **Describe the motion used to create this graph: slowly lowered hand, then lowered it faster** |

Trial 6: A graph with two linear sections with one section having a positive slope and one section having a negative slope

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| *Insert your graph* |
| **Describe the motion used to create this graph: raised hand slowly, then lowered slowly** |

Apply your Learning

1. Describe how you should move to make the following position *vs*. time graph. Test your answer using a motion detector.



Lower hand, then raise hand higher than starting point, then hold hand steady